MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

Chateau Resort Continuing Care Retirement Community

APN: 0479-131-09

Prepared for:

MOJAVE NARROWS CHATEAU MANAGEMENT, LLC

440 E. Hunnington Drive

Arcardia, CA. 91006

Tel: 626-231-0704

NOT APPROVED
REVIEWED BY
Osvaldo Roque at 3:12:56 PM, 07/02/2020

Prepared By

Red Brick Solutions, LLC
33 S Rio Grande Street
Suite 203
Salt Lake City, Utah 84101

T 661-816-5179

Submittal Date: January 31, 2018

Revision No. and Date: Rev 1: August 6, 2018

Revision No. and Date: Rev 2: October 10, 2018

Revision No. and Date: Rev 3: April 25, 2019

Revision No. and Date: Insert No and Current Revision Date

Revision No. and Date: Insert No and Current Revision Date

Final Approval Date:_____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Mojave Narrows Chateau Management, LLC by Red Brick Solution. The WQMP is intended to comply with the requirements of the County of San Bernardino and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):	P201800062	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):	APN: 0479-131-09	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0479-131-09

Owner's Signature			
Owner Name: Mary Brown			
Title	Manager		
Company	Mojave Narrows Chateau Management, LLC		
Address	440 E. Huntington Drive, 3rd Floor, Arcardia, CA 91006		
Email	mbrown@caadapt.com		
Telephone #	626-231-0704		
Signature		Date	April 25 2019

Preparer's Certification

Project Data			
Permit/Application Number(s):	P201800062	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):	APN: 0479-131-09	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0479-131-09

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: David W. Larson	
Title	Principal
Company	Red Brick Solution
Address	331 South Rio Grande Street, #203, Salt Lake City, UT 84101
Email	david@redbricksolution.com
Telephone #	801-224-5335
Signature	
Date	April 25 2019

PE Stamp Below

Table of Contents

Forms

Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Chateau Resort Continuing Care Retirement Community				
Project Owner Contact Name:	Mary Brown - Mojave Narrows Chateau Management, LLC				
Mailing Address:	440 E. Huntington Drive, 3rd Floor, Arcadia, CA 91006	E-mail Address:	mbrown@caadapt.com	Telephone:	626-231-0704
Permit/Application Number(s):	NA	Tract/Parcel Map Number(s):	APN: 0479-131-09		
Additional Information/ Comments:	NA				
Description of Project:	18.66 acre project consisting of vacant land composed of an existing 6.05 acre ~~off-site~~ drainage channel and a 12.61 acre developable site consisting of two drainage areas that will support 1) 49,800 sf independent living apartment 2) 60,200 sf Assisted Living Facility 3) 47,660 sf Skilled Nursing Facility 4) 24,720 sf Rehabiliation Facility 5) 31,260 sf Medical Pavillion with 455 parking spaces. The developable site is bisected from the west side to the eastside by an existing ridge creating two distinct draiange areas. The South 11.51 acre drainage area (DA1) drains southeast to the southern boundry where it confluences with historic off-site flows and exits the site at the southeast corner. DA1 has a westerly 9.06 acre off-site tributary watershed that will be captured off-site by a storm drain appoximately 650' north of the southwest property corner that transports them through the site. The northern 1.1 acre (DA2) drainage area drains to the northeast and on to the Mojave River Regional Park. Our 12.61 acre developed site will similarly drain DA1 to the southeast corner of the project into a retention/ infiltration basin underneath the parking lot. Excess mitigated flows will be released to confluence with the historic off-site flows prior to exiting the site at the southeast corner. The northern DA2 flows will drain to the northeast to an underground retention/infiltation under the parking lot where mitigated flows will exit at the historic point of confluence with off-site flows..				

Confusing. As read, it implies the project consists of another off-site area

Provide breakdown of 12.61 ac.
XXft2 building
XXft2 pavement
XXft2 landscaping, etc.

Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A

Section 2 Project Description

2.1 Project Information

The WQMP shall provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):

☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface

☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) *Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.*

2 Project Area (ft2):	548,865	**3** Number of Dwelling Units:	270 Rooms	**4** SIC Code:	8059

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The property will be owned by Mojave Narrow Chateau Management LLC and operated by a "Yet to be Determined" Licensed health care operator who will eventually be the responsible party. Currently the resonsible party will be Mary Brown the owners representative.

cell 818-795-048

missing number

Mary Brown
[Title]
818-795-04.. (missing digit)
[Address]

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Medical Waste
Nutrients - Phosphorous	E ☒	N ☐	Fertilizers
Nutrients - Nitrogen	E ☒	N ☐	Fertilizers
Noxious Aquatic Plants	E ☒	N ☐	nuiscence water
Sediment	E ☐	N ☒	
Metals	E ☒	N ☐	Parking Area
Oil and Grease	E ☒	N ☐	Parking Area
Trash/Debris	E ☒	N ☐	Parking and Trash Containers
Pesticides / Herbicides	E ☒	N ☐	Landscaping
Organic Compounds	E ☒	N ☐	Landscaping
Other: Flouride	E ☒	N ☐	Mojave River
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed Drainage Management Areas (DMAs)) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet. A map presenting the DMAs must be included as an appendix to the WQMP document.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34do30'30"N	Longitude 117o16'34"W	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Desert

2 Does the site have more than one drainage area (DA): Yes☒ No☐ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*

See Exhibits A & B attached

Provide schematic

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA C flows to DA1 DMA A	*Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property*
DA1 DMA A to Outlet 1	DA1 on-site commercial flows travel northeast and and then southeast 2066 lineal feet along interior streets to the southeasterly property corner where the flows are directed into an underground retention\detention basin whos mitigated flows confluence with the off-site southerly boundry flows as they exit east.
DA1 DMA B to Outlet 1	
DA2 to Outlet 2	DA2 storm flows sheet flow across parking lot to curb and gutter along the eastern property line and enter an undergroung reention/infiltration basin with mitigated flows exiting the site at their historic confluence point with off-site flows.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	463,002			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	1,167			
6 Longest flowpath slope (ft/ft)	0.011			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Open Brush			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Fair	~~SEE EXHIBIT C~~		

Form 3-2 Existing Hydrologic Characteristics for Drainage Area (DA2)

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	85,863			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A			
5 Longest flowpath length (ft)	670			
6 Longest flowpath slope (ft/ft)	0.019			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Open Brush			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Fair			

Form 3-3 Watershed Description for Drainage Area

Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River (Mojave Forks Reservoir outlet to Upper Narrows) CAR628200002008081619514 8
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	1,1,2-trichloro- 1,2,2-trifluoroethane | 1,1-dichloroethane | 1,3-dichlorobenzene | 1,4-dichlorobenzene | 1,1,1,-trichloroethane | 1,1-dichloroethylene (DCE)/Vinylidene Chloride | 1,2-dichloroethane | 1,2-dichloroethylene,-trans | 1,2-dichloropropane | Benzene | Bromoform | Carbon tetrachloride | Chlorobenzene (mono) | Chlorodibromomethane | Chloroform | Dichlorobromomethane | Dichlorodifluorormethane | Dichloromethane | Diethyl ether| Disopropyl ether | Ethylbenzene | Methyl Tertiary-Butyl Ether (MTBE) | Methyl tert-pentyl ether | Styrene | Tert-butyl ethyl ether | Tetrachloroethylene/PCE | Toluene | Trichloroethene | Trichlorofluoromethane (CFC-11) | Vinyl chloride | cis-1,2 Dichloroethylene | m-Xylene | o-Dichlorobenzene | o-Xylene
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	After review of the available data and information, RWQCB staff concludes that the water body-pollutant combination shoud be palced on the section 303(d) list (Flouride in Mojave River) based on 2014 Integrated Report.
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	DESERT TORTOISE HABITAT CAT 3, MOJAVE GROUND SQUIRREL, SOUTHWESTERN WILLOW FLYCATCHER
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Utilize 2014 and 2016 integrated report

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

What educational materials? Refer to section 7.2 of WQMP TGD

At a minimum, pesticides shall be placed by a licensed applicator.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Environmental awareness education materials ill be developed for the site and distributed to all staff and residents.
N2	Activity Restrictions	☒	☐	Conditions, covenants and restrictions (CCRs) will be prepared by the developer restricting dumping waste down catch basins for the purpose of surface water quality protection.
N3	Landscape Management BMPs	☒	☐	CC&R's will be prepared limiting fertilizer and/or pesticide. usage.
N4		☒	☐	The responsible person in charge, will hire an independent testing laboritory to test clearifiers after each storm event to determine if any contmination has reached off-site areas. The RPIC will also schedule cleaining and/or maintenance of all structural BMP facilities.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Biologccal and chemical hazardus waste will be separated at the source, bagged, picked up and stored at a secured central location for disposal by liscensed agency
N6	Local Water Quality Ordinances	☒	☐	The RPIC will contact LAHONTON water quality control board to determine specific local ordinances.
N7	Spill Contingency Plan	☒	☐	"no dumping" signaage will be applied to all catch basins. Hazardous material storage will have containment curbs. All hazardous material MS sheets will docuented.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tank complance proposed.
N9	Hazardous Materials Disclosure Compliance	☒	☐	Bio-Hazardous and chemical hazardous Materials will be identified and reported to local health and fire agencies.

Property owner shall be responsible for the maintenance of all site BMP's. (may describe contracting of such maintenance services, but the owner is responsible).

Will a spill contingency plan be developed? What will it consist of? Use previous response, but do not delegate responsibility to future building operator.

Project to follow local water quality ordinances through implementation of WQMP.

Revise. This item is on reference to Article 80 of UFC.

typically includes litter patrol, emptying of trash recepticles in common areas, and reporting of improper waste disposal by tenants.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Sinage will be provided identifying Exit paths, fire extingishers locations, and yearly inspections maintained by the local fire authority.
N11	Litter/Debris Control Program	☒	☐	The owner/POA will contract trash removal along with landscape maintenance.
N12	Employee Training	☒	☐	Owner/POA training manual will be provided and training of staff and reidence will occure bi-annually and with new occupant.
N13	Housekeeping of Loading Docks	☒	☐	Loading areas will be cleaned and maintained after each delivery.
N14	Catch Basin Inspection Program	☒	☐	The Owner will have at least 80% of drainage facilities inspected, cleaned and maintained on annual basis and 100% in a two-year period using an outside agency.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	The owner/POA will swep Streets and parking lots as required by the local agency.
N16	Other Non-structural Measures for Public Agency Projects	☒	☐	As a parcially Federally funded site additional non-structural measures for public agency projects may be required and will be implemented.
N17	Comply with all other applicable NPDES permits	☒	☐	The owner/POA will comply with the State ~~SWPPP and local governing agncies.~~

Does the project feature actual loading docks? Verify/revise.

Which is how often? Refer to TGD

General Construction Permit and develop a SWPPP

At what frequency?

As in a storage building? If so, this would not be outdoor material storage.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Storm drain inlets and catch basins will be labeled "No Dumping" and will maintain legibility of stencils and signs.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☒	☐	An outdoor walled in concrete storage area will be paved and have a roof.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	The enclosure area will be paved with an impervious surface and provide solid roof or awning to prevent exposure to direct precipitation.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	All landscaped areas will be designed based on efficient irrigation systems such as timing and application methods and group plans with similar water requirements to minimize the runoff of excess irrigation water.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	All landscape pockets, fingers, setback areas, parkway strips, street medians shall be finish-graded at a min of 1-2 inches below top of curb or sidewalk for increased retention/infiltration of stormwater and irrigation water.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Storm Dain Channel Slope Protection will be concrete lining with volocity dissipation drop stuctures and rip-rap.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No covered dock areas proposed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No covered maintenance bays with spill containment plans proposed.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	~~Project does not require fleet vehicle, thus no spill containment plans proposed.~~
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No covered outdoor processing areas proposed.

No carwashing proposed on site

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash ing proposed.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling ~~areas~~ proposed.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No Hillside Landscaping proposed.
S14	Wash water control for food preparation areas	☐	☒	No outdoor ~~wash water for~~ food preparation ~~areas~~ are planned for this site. All food prparation will be indoors
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community car wash racks proposed.

Wash water for food preparation areas will drain to sanitary sewer.

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attache[d] ...s how preventative site design practices are included in WQMP

Include proposal for landscaping to minimize impervious areas.

Additionally, the site features underground chambers to maximize infiltration

Refer to Section 5.2 of the ...ils.

Form 4.1-3 Site Design Practi...

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: where posible concrete hardscapes will be constructed using pavers or pourous conctrete.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Native soils have high infiltration rates. Hardscapes will be designed to drain onto landscape areas prior to entering stoerm drain system.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: off-site draiange will exit the site as historic native flows, and on-site predeveloped flows will be detained and exist the site at historic conveyance points.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes ... infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation: ~~retention basin~~ will mitigate flows prior to release.
Use of Porous Pavement.: Yes ☒ No ☐ Explanation: to be used in areas within the interior court yard where silts from wind will not clog.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: No the site will be fully developed. Any Joshua trees that can be transplanted wil be relocated to neighboring property along the railrod tracts which is commonly owned.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: All proposed landscape ares will be vegetated with drought tolerant vegetation.

Does this include preservation of Tc?

Project description and exhibit does not feature basins

uncheck

relocated

gravel

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☐ No ☒ Explanation: Infiltration basin under parking area will be compacted for vehicle loading. In-situ soils below proposed retention pipes will not be compacted and gracel backfill will be used to retain high infiltration rates.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☒ Explanation: This facility is for elderly who need smooth surfaces. Storm pipe can be pebelow rcolated to allow into pervious area.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Areas along propertry lines and areas greater than 400 sq ft will be staked.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: an under ground retention/detention infiltration will be used as an alternative.
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☒ No ☐ Explanation: Heavy grading compaction will be limited to within 10 feet of future steam bed

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
[1] Project area DA 1 (ft^2): 501,480	[2] Imperviousness after applying preventative site design practices (Imp%): 76.3	[3] Runoff Coefficient (Rc): _0.56 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.349 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.432 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] Compute design capture volume, DCV (ft^3): 19,737 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 4,659 *Form 4.2-3 Item 12*	[2] 12.42 *Form 4.2-4 Item 13*	[3] 2.93 *Form 4.2-5 Item 10*
Post-developed	[4] 10,015 *Form 4.2-3 Item 13*	[5] 15.24 *Form 4.2-4 Item 14*	[6] 8.67 *Form 4.2-5 Item 14*
Difference	[7] *5,356* *Item 4 – Item 1*	[8] *-2.82* *Item 2 – Item 5*	[9] *5.74* *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] *115%* *Item 7 / Item 1*	[11] *-23%* *Item 8 / Item 2*	[12] *196%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	O-Brush							
2a Hydrologic Soil Group (HSG)	A							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	463,002							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	62							
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	Commerci							
2b Hydrologic Soil Group (HSG)	A							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	501,480							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	32							

5 Pre-Developed area-weighted CN: 62	**7** Pre-developed soil storage capacity, S (in): 6.13 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 1.23 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 32	**8** Post-developed soil storage capacity, S (in): 21.25 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 4.25 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.11
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 4,659
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 10,015
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft^3): 4,855
*Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-4 Hydromodification Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	1,167				2,066			
2 Change in elevation (ft)	12.5				12			
3 Slope (ft/ft), *S_o = Item 2 / Item 1*	0.0107				0.0058			
4 Land cover	Und-fair				Commercial			
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	12.42				15.24			
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	0	0			0			
7 Cross-sectional area of channel (ft^2)	400				3.713			
8 Wetted perimeter of channel (ft)	200				22.76			
9 Manning's roughness of channel (n)	0.033				0.015			
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	7.44				2.26			
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	0				0			
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	12.42				15.24			

13 Pre-developed time of concentration (min): 12.42 *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): 15.24 *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet hydromodification requirement (min): -3.44 *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14*

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*		1.05			0.91		
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		7.13			11.51		
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.9			0.1		
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0.66			0.74		
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.59			0.07		
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		2.93			8.67		
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*	0	0	*n/a*	0	0
	DMA B	0	*n/a*	0	0	*n/a*	0
	DMA C	0	0	*n/a*	0	0	*n/a*

8 Pre-developed Q_p at T_c for DMA A: 2.93 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: 0.00 *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: 0.00 *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): 2.93 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: 8.67 *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: 0.00 *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: 0.00 *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): 8.67 *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): 5.30 *$Q_{p\text{-}hydro}$ = (Item 14 * 0.95) – Item 10*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA2)		
[1] Project area DA2 (ft^2): 47,860	[2] Imperviousness after applying preventative site design practices (Imp%): 81.0	[3] Runoff Coefficient (Rc): _0.61 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.349 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.432 *P_6 = Item 4 * C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
[6] Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] Compute design capture volume, DCV (ft^3): 2,066 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of Hydromodification Assessment (DA2)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 445 *Form 4.2-3 Item 12*	[2] 2.88 *Form 4.2-4 Item 13*	[3] 2.30 *Form 4.2-5 Item 10*
Post-developed	[4] 956 *Form 4.2-3 Item 13*	[5] 2.58 *Form 4.2-4 Item 14*	[6] 3.05 *Form 4.2-5 Item 14*
Difference	[7] *511* *Item 4 – Item 1*	[8] *0.3* *Item 2 – Item 5*	[9] *0.75* *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] *115%* *Item 7 / Item 1*	[11] *10%* *Item 8 / Item 2*	[12] *33%* *Item 9 / Item 3*

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA2)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	O-Brush							
2a Hydrologic Soil Group (HSG)	A							
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	85,863							
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	62							
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	Commerci							
2b Hydrologic Soil Group (HSG)	A							
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	47,860							
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	32							

5 Pre-Developed area-weighted CN: 62	**7** Pre-developed soil storage capacity, S (in): 6.13 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 1.23 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 32	**8** Post-developed soil storage capacity, S (in): 21.25 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 4.25 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 2.11
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): 445
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): 956
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft^3): 463
*Vhydro = (Item 13 * 0.95) – Item 12*

Form 4.2-4 Hydromodification Assessment for Time of Concentration (DA2)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA2 *Use additional forms if there are more than 4 DMA*				Post-developed DA2 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	670				350			
2 Change in elevation (ft)	13				6.6			
3 Slope (ft/ft), S_o *= Item 2 / Item 1*	0.019				0.013			
4 Land cover	Und-fair				Commercial			
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	2.88				2.58			
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	0				0			
7 Cross-sectional area of channel (ft^2)	400				3.713			
8 Wetted perimeter of channel (ft)	200				22.76			
9 Manning's roughness of channel (n)	0.033				0.015			
10 Channel flow velocity (ft/sec) V_{fps} *= (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	10.01				2.26			
11 Travel time to outlet (min) T_t *= Item 6 / (Item 10 * 60)*	0				0			
12 Total time of concentration (min) T_c *= Item 5 + Item 11*	2.88				2.58			

13 Pre-developed time of concentration (min): 2.88 *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): 2.58 *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet hydromodification requirement (min): 0.16 $T_{C\text{-}Hydro}$ *= (Item 13 * 0.95) – Item 14*

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA2)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*		2.92			3.16		
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		1.10			1.10		
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.9			0.1		
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0.66			0.74		
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.59			0.07		
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		2.30			3.05		
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*	0	0	*n/a*	0	0
	DMA B	0	*n/a*	0	0	*n/a*	0
	DMA C	0	0	*n/a*	0	0	*n/a*

8 Pre-developed Q_p at T_c for DMA A: 2.30 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: 0.00 *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: 0.00 *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): 2.30 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: 3.05 *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: 0.00 *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: 0.00 *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): 3.05 *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): 0.60 *$Q_{p\text{-}hydro}$ = (Item 14 * 0.95) – Item 10*		

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

> Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable Site Design BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than ten feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstre Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil grou investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.
If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Site Design BMPs.

Verify. This is in reference to the vicinity of the improved channel - infiltration basin will be located 50feet from channel slopes.

Provide infiltration testing and factor of safety worksheet. 4th request.

Form 4.3-1 Infiltration BMP Feasibility (DA2)

Feasibility Criterion – Complete evaluation for each DA on the Project Site	
[1] Would infiltration BMP pose significant risk for groundwater related concerns? *Refer to Section 5.3.2.1 of the TGD for WQMP*	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[3] Would infiltration of runoff on a Project site violate downstream water rights?	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? *See Section 3.5 of the TGD for WQMP and WAP*	Yes ☐ No ☒
If Yes, Provide basis: (attach)	
[7] Any answer from Item 1 through Item 3 is "Yes": *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.* *If no, then proceed to Item 8 below.*	Yes ☐ No ☒
[8] Any answer from Item 4 through Item 6 is "Yes": *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.* *If no, then proceed to Item 9, below.*	Yes ☐ No ☒
[9] All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible. LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Site Design BM*	

Provide infiltration testing and factor of safety worksheet. 4th request.

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive

with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3):		$V_{retention}$ *=Sum of Item 4 for all BMPs*	
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3):		$V_{retention}$ *=Sum of Item 12 for all BMPs*	

Form 4.3-2 cont. Site Design BMPs (DA 1)

14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA 1 DMA 1 BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3):	$V_{retention}$ *= Sum of Item 17 for all BMPs*		
19 Total Retention Volume from Site Design BMPs:	*Sum of Items 5, 13 and 18*		

Form 4.3-2 Site Design BMPs (DA2)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design BMPs (DA2)

14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA2 DMA 1 BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3):	$V_{retention}$ *= Sum of Item 17 for all BMPs*		
19 Total Retention Volume from Site Design BMPs: 0 *Sum of Items 5, 13 and 18*			

4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): 19,737 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA 1 BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	7.4		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	9		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.82		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	0		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.29		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	0		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0		
10 Amended soil porosity	1		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	4		
12 Gravel porosity	0.37		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	0		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	19,737		
16 Total Retention Volume from LID Infiltration BMPs: 19,737 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: 100% *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

Provide infiltration testing and factor of safety worksheet. 4th request.

Provide manufacturer specifications

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA2)

1 Remaining LID DCV not met by site design BMP (ft^3): 2,066 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA2 DMA 1 BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	7.4		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	9		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.82		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	7		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.29		
8 Infiltrating surface area, *SA_{BMP}* (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	0		
9 Amended soil depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0		
10 Amended soil porosity	1		
11 Gravel depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	4		
12 Gravel porosity	0.37		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	0		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	3,525		
16 Total Retention Volume from LID Infiltration BMPs: 3,525 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: 171% *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

Provide infiltration testing and factor of safety worksheet. 4th request.

Provide manufacturer specifications

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): 0.00 *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.* Oil and greese, trash and debris, fluoride, metal, and pesticide	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-5 and 4.3-6 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): 0.00 *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0.00% *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): 0.00 *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☒ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA2)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): 0.00 *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.* Oil and greese, trash and debris, fluoride, metal, and pesticide	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-5 and 4.3-6 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): 0.00 *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0.00% *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): 0.00 *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☒ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-5 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-6 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (E.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-7 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Su ternative Compliance Volume L)

Revise Form per comments on referenced items

1 Total LID DCV for the Project DA-1 (ft^3): 19,737 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): 0.00 *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 19,737 *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft^3): 0.00 *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): 0.00 *Copy Item 6 in Form 4.3-4*

6 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

Verify

Uncheck

7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*

- Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated:
  1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐
  2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐
  3) Equal or greater protection against shock loadings and spills; ☐
  4) Equal or greater accessibility and ease of inspection and maintenance. ☐

Form 4.3-8 Conformance Su[illegible]ternative Compliance Volume[illegible]2)

Revise Form per comments on referenced items

1 Total LID DCV for the Project DA-2 ft³): 2,066 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft³): 0 *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft³): 3,525 *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft³): 0.00 *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): 0.00 *Copy Item 6 in Form 4.3-4*

6 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐ ← Verify
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
  - On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒ ← Uncheck
    If yes, Form 4.3-1 Items 7 and 8 were both checked yes

7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*

- Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated:
  1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐
  2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐
  3) Equal or greater protection against shock loadings and spills; ☐
  4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 4,855 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 19,737 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): -14,881 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): 0.00

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☒
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒

Form 4.3-9 Hydromodification Control BMPs (DA2)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 463.39 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 3,525 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): -3,061.61 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): 0.00

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☒
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Retention Basin	Operator	Clear weeds and vegetation	yearly
SD-12	Landscape Maitenance		
SD-13		legibility or markers	yearly
SD-32		maintain screens, covers, signs	
SD-34		maintain screens, walls, covers, signs	

Comments may be provided on this section in final report

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

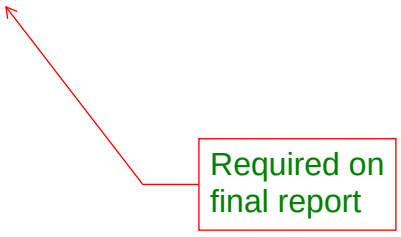
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

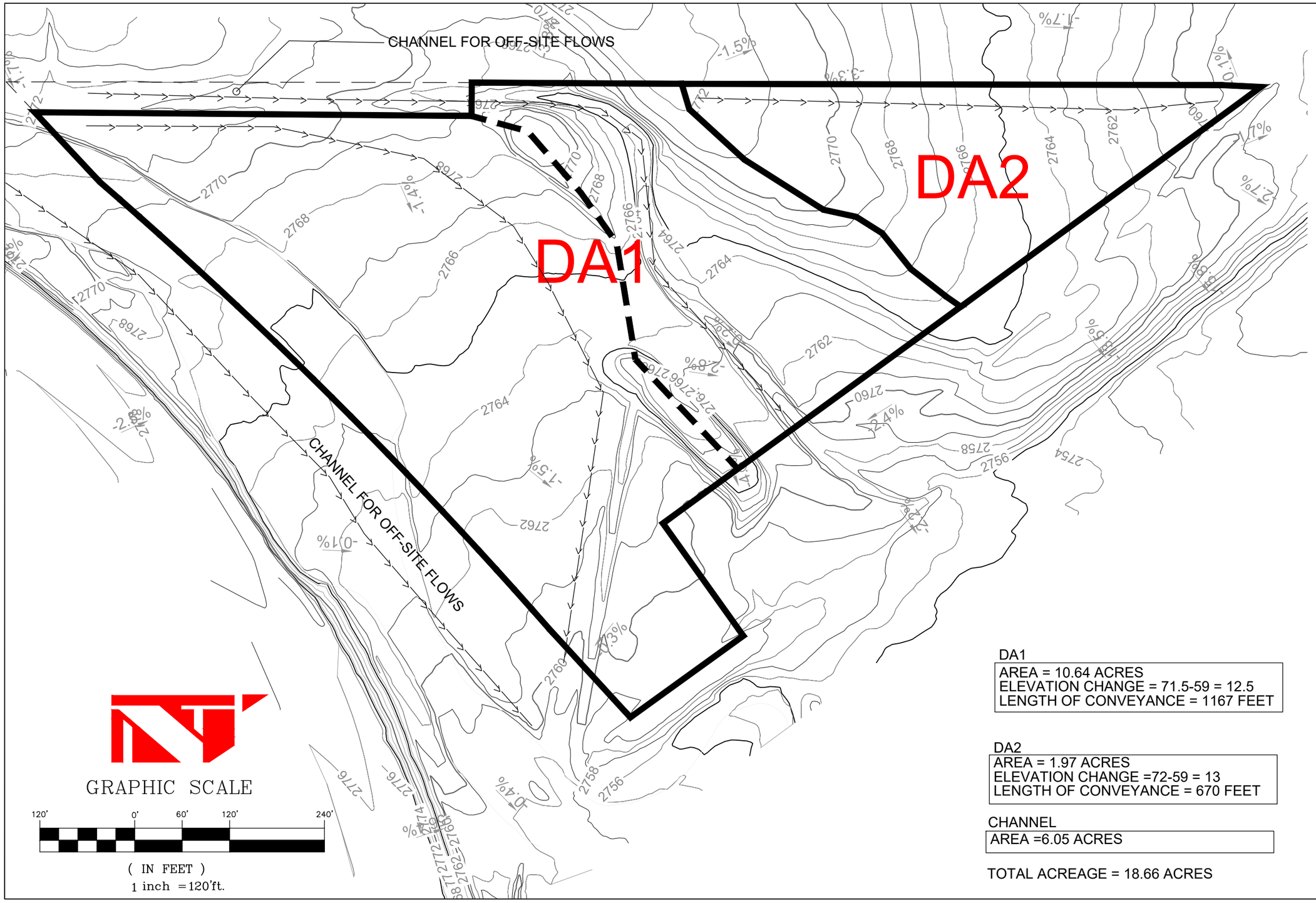
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements





DA1
AREA = 10.64 ACRES
ELEVATION CHANGE = 71.5-59 = 12.5
LENGTH OF CONVEYANCE = 1167 FEET

DA2
AREA = 1.97 ACRES
ELEVATION CHANGE =72-59 = 13
LENGTH OF CONVEYANCE = 670 FEET

CHANNEL
AREA =6.05 ACRES

TOTAL ACREAGE = 18.66 ACRES

MOJAVE NARROWS SENIOR PAVILION

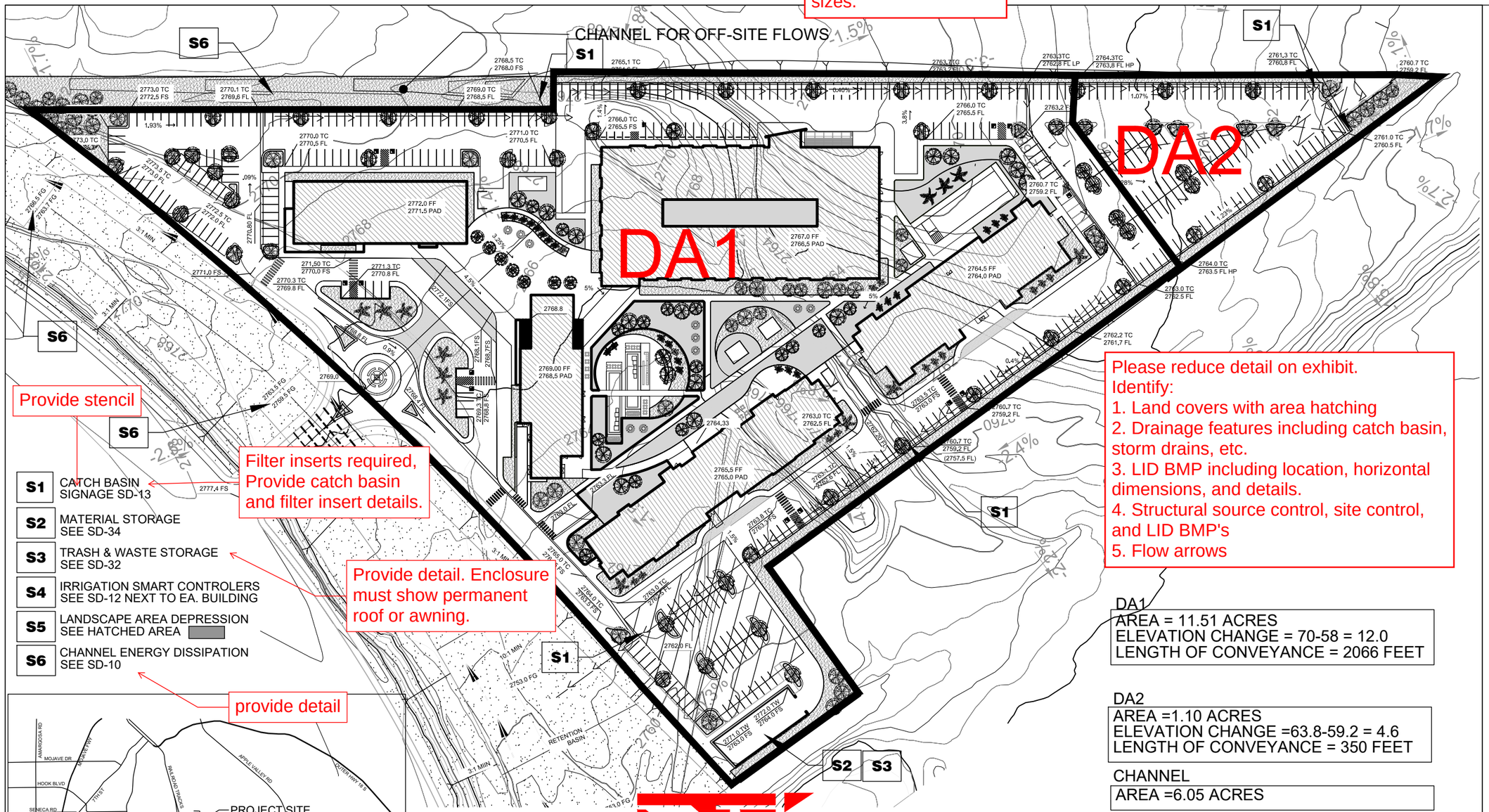
WQMP SITE PLAN

EXISTING DRAINAGE AREAS

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT A

Identify all catch basins.
Call out SD pipes and sizes.



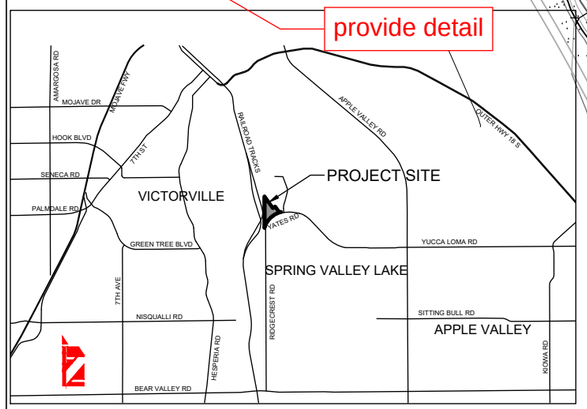
Provide stencil

Filter inserts required, Provide catch basin and filter insert details.

Provide detail. Enclosure must show permanent roof or awning.

provide detail

S1	CATCH BASIN SIGNAGE SD-13
S2	MATERIAL STORAGE SEE SD-34
S3	TRASH & WASTE STORAGE SEE SD-32
S4	IRRIGATION SMART CONTROLERS SEE SD-12 NEXT TO EA. BUILDING
S5	LANDSCAPE AREA DEPRESSION SEE HATCHED AREA
S6	CHANNEL ENERGY DISSIPATION SEE SD-10



VICINITY MAP

GRAPHIC SCALE

120' 0' 60' 120' 240'

(IN FEET)
1 inch =120'ft.

Please reduce detail on exhibit.
Identify:
1. Land covers with area hatching
2. Drainage features including catch basin, storm drains, etc.
3. LID BMP including location, horizontal dimensions, and details.
4. Structural source control, site control, and LID BMP's
5. Flow arrows

DA1
AREA = 11.51 ACRES
ELEVATION CHANGE = 70-58 = 12.0
LENGTH OF CONVEYANCE = 2066 FEET

DA2
AREA =1.10 ACRES
ELEVATION CHANGE =63.8-59.2 = 4.6
LENGTH OF CONVEYANCE = 350 FEET

CHANNEL
AREA =6.05 ACRES

TOTAL ACREAGE = 18.66 ACRES

S# SOURCE CONTROL SEE BMP'S ATTACHED

UNDERGROUND RETENTION
INFILTRATION BASIN = 23,000 SF

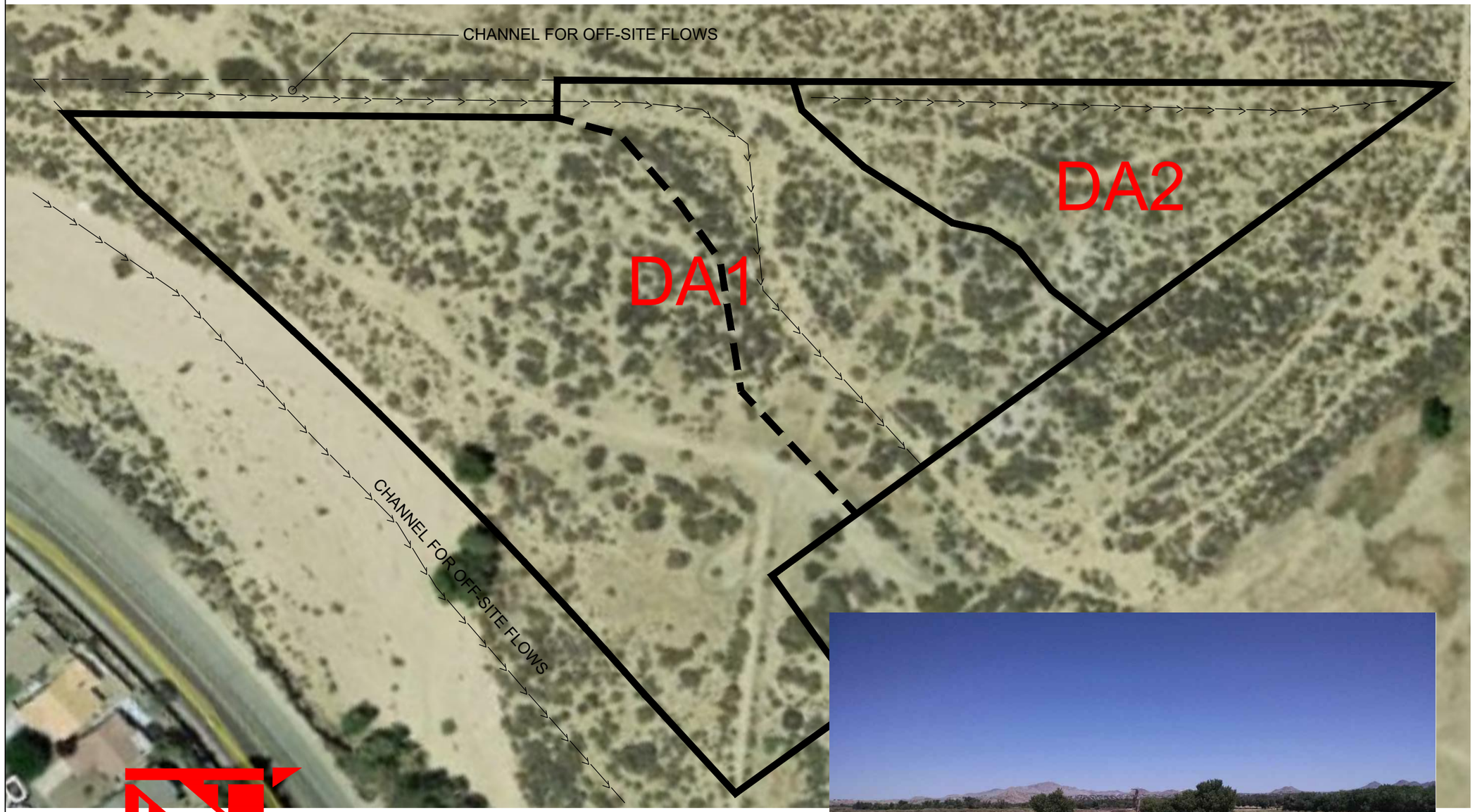
MOJAVE NARROWS SENIOR PAVILION

WQMP SITE PLAN

DEVELOPED DRAINAGE AREAS

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT B



GRAPHIC SCALE

120' 0' 60' 120' 240'

(IN FEET)
1 inch = 120'ft.

RE: FORM 3-2.8

MOJAVE NARROWS SENIOR PAVILION

WQMP

SITE PLAN

PERVIOUS AREA CONDITION

FAIR

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT C

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.5083°, Longitude: -117.2761°
Elevation: 2768.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.092** (0.076-0.113)	**0.128** (0.106-0.157)	**0.178** (0.147-0.219)	**0.222** (0.181-0.275)	**0.285** (0.225-0.364)	**0.337** (0.260-0.440)	**0.392** (0.296-0.525)	**0.453** (0.332-0.623)	**0.540** (0.381-0.775)	**0.613** (0.417-0.910)
10-min	**0.132** (0.109-0.162)	**0.184** (0.152-0.225)	**0.256** (0.210-0.314)	**0.318** (0.259-0.394)	**0.408** (0.322-0.522)	**0.482** (0.373-0.630)	**0.562** (0.424-0.753)	**0.649** (0.476-0.893)	**0.775** (0.546-1.11)	**0.879** (0.598-1.30)
15-min	**0.160** (0.132-0.196)	**0.222** (0.183-0.272)	**0.309** (0.254-0.380)	**0.384** (0.314-0.476)	**0.494** (0.390-0.632)	**0.583** (0.451-0.762)	**0.680** (0.513-0.910)	**0.785** (0.576-1.08)	**0.937** (0.660-1.34)	**1.06** (0.723-1.58)
30-min	**0.214** (0.176-0.262)	**0.297** (0.245-0.363)	**0.413** (0.339-0.507)	**0.513** (0.419-0.635)	**0.659** (0.520-0.843)	**0.779** (0.602-1.02)	**0.908** (0.685-1.22)	**1.05** (0.769-1.44)	**1.25** (0.881-1.79)	**1.42** (0.965-2.11)
60-min	**0.251** (0.208-0.308)	**0.349** (0.288-0.428)	**0.486** (0.399-0.596)	**0.604** (0.492-0.747)	**0.775** (0.612-0.992)	**0.916** (0.708-1.20)	**1.07** (0.806-1.43)	**1.23** (0.905-1.70)	**1.47** (1.04-2.11)	**1.67** (1.14-2.48)
2-hr	**0.354** (0.292-0.433)	**0.477** (0.393-0.584)	**0.646** (0.531-0.794)	**0.791** (0.646-0.980)	**1.00** (0.789-1.28)	**1.17** (0.904-1.53)	**1.35** (1.02-1.81)	**1.54** (1.13-2.12)	**1.82** (1.28-2.61)	**2.05** (1.39-3.04)
3-hr	**0.424** (0.350-0.519)	**0.565** (0.466-0.692)	**0.759** (0.624-0.932)	**0.924** (0.754-1.14)	**1.16** (0.915-1.48)	**1.35** (1.04-1.76)	**1.55** (1.17-2.08)	**1.76** (1.30-2.43)	**2.07** (1.46-2.97)	**2.31** (1.57-3.43)
6-hr	**0.576** (0.476-0.705)	**0.762** (0.629-0.934)	**1.01** (0.835-1.25)	**1.23** (1.00-1.52)	**1.53** (1.21-1.96)	**1.77** (1.37-2.31)	**2.02** (1.52-2.70)	**2.28** (1.67-3.14)	**2.65** (1.87-3.80)	**2.95** (2.01-4.37)
12-hr	**0.741** (0.612-0.906)	**0.988** (0.815-1.21)	**1.32** (1.08-1.62)	**1.59** (1.30-1.97)	**1.97** (1.56-2.52)	**2.27** (1.76-2.97)	**2.58** (1.95-3.45)	**2.90** (2.13-3.99)	**3.35** (2.36-4.80)	**3.70** (2.52-5.49)
24-hr	**0.959** (0.851-1.10)	**1.30** (1.15-1.50)	**1.75** (1.54-2.02)	**2.11** (1.85-2.46)	**2.61** (2.22-3.15)	**3.00** (2.49-3.69)	**3.40** (2.76-4.29)	**3.82** (3.01-4.94)	**4.38** (3.31-5.92)	**4.83** (3.53-6.74)
2-day	**1.12** (0.995-1.29)	**1.54** (1.37-1.78)	**2.10** (1.85-2.42)	**2.55** (2.24-2.97)	**3.18** (2.69-3.83)	**3.66** (3.04-4.50)	**4.15** (3.37-5.23)	**4.67** (3.68-6.05)	**5.37** (4.06-7.25)	**5.92** (4.32-8.27)
3-day	**1.23** (1.09-1.41)	**1.70** (1.51-1.96)	**2.33** (2.06-2.69)	**2.84** (2.49-3.31)	**3.55** (3.00-4.27)	**4.09** (3.40-5.03)	**4.65** (3.77-5.86)	**5.23** (4.12-6.78)	**6.03** (4.56-8.14)	**6.65** (4.86-9.29)
4-day	**1.30** (1.16-1.50)	**1.81** (1.60-2.09)	**2.48** (2.19-2.87)	**3.03** (2.65-3.53)	**3.78** (3.20-4.55)	**4.36** (3.62-5.36)	**4.95** (4.01-6.24)	**5.57** (4.39-7.21)	**6.41** (4.85-8.65)	**7.07** (5.16-9.87)
7-day	**1.41** (1.25-1.62)	**1.94** (1.72-2.24)	**2.64** (2.34-3.05)	**3.22** (2.82-3.75)	**4.00** (3.39-4.82)	**4.60** (3.82-5.66)	**5.22** (4.23-6.57)	**5.85** (4.61-7.58)	**6.72** (5.08-9.06)	**7.39** (5.40-10.3)
10-day	**1.49** (1.32-1.71)	**2.04** (1.81-2.35)	**2.77** (2.44-3.20)	**3.36** (2.95-3.92)	**4.18** (3.54-5.03)	**4.80** (3.99-5.90)	**5.44** (4.41-6.85)	**6.10** (4.80-7.90)	**6.99** (5.28-9.44)	**7.68** (5.61-10.7)
20-day	**1.69** (1.50-1.95)	**2.33** (2.07-2.69)	**3.19** (2.82-3.69)	**3.90** (3.42-4.54)	**4.87** (4.13-5.86)	**5.63** (4.67-6.92)	**6.40** (5.18-8.06)	**7.20** (5.67-9.33)	**8.29** (6.27-11.2)	**9.14** (6.68-12.8)
30-day	**1.90** (1.69-2.19)	**2.64** (2.34-3.05)	**3.65** (3.22-4.22)	**4.49** (3.93-5.23)	**5.66** (4.80-6.81)	**6.58** (5.46-8.09)	**7.53** (6.10-9.49)	**8.53** (6.72-11.0)	**9.90** (7.48-13.4)	**11.0** (8.01-15.3)
45-day	**2.23** (1.97-2.56)	**3.12** (2.76-3.59)	**4.34** (3.84-5.02)	**5.39** (4.72-6.28)	**6.88** (5.83-8.28)	**8.07** (6.70-9.93)	**9.33** (7.56-11.8)	**10.7** (8.40-13.8)	**12.5** (9.47-16.9)	**14.0** (10.2-19.6)
60-day	**2.41** (2.14-2.77)	**3.38** (2.99-3.89)	**4.75** (4.19-5.48)	**5.93** (5.20-6.91)	**7.65** (6.49-9.22)	**9.06** (7.52-11.1)	**10.6** (8.56-13.3)	**12.2** (9.60-15.8)	**14.5** (11.0-19.6)	**16.4** (12.0-22.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Section 4-2.3 11 PRECIPITATION DATA FROM NOAA

Stormwater Detention System Worksheet

Pipe Dia. D (in)	Outside Dia. OD (ft)	C (ft)	Clr. Span S (ft)	Det. Area Factor (ft2/ft3)
12	1.20	1.75	1.10	2.86
15	1.46	2.00	1.07	2.07
18	1.77	2.36	1.19	1.66
24	2.32	2.97	1.57	1.23
30	2.93	4.04	2.23	1.05
36	3.48	4.52	2.09	0.79
42	3.98	5.44	2.92	0.65
42HC	3.90	4.95	2.10	0.64
48HC	4.39	5.45	2.11	0.53
60HC	5.46	5.91	2.87	0.43

Project Mojave Narrows
Location Hesperia CA
Engineer David Larson, Redbrick Solution
Date 4/30/2019

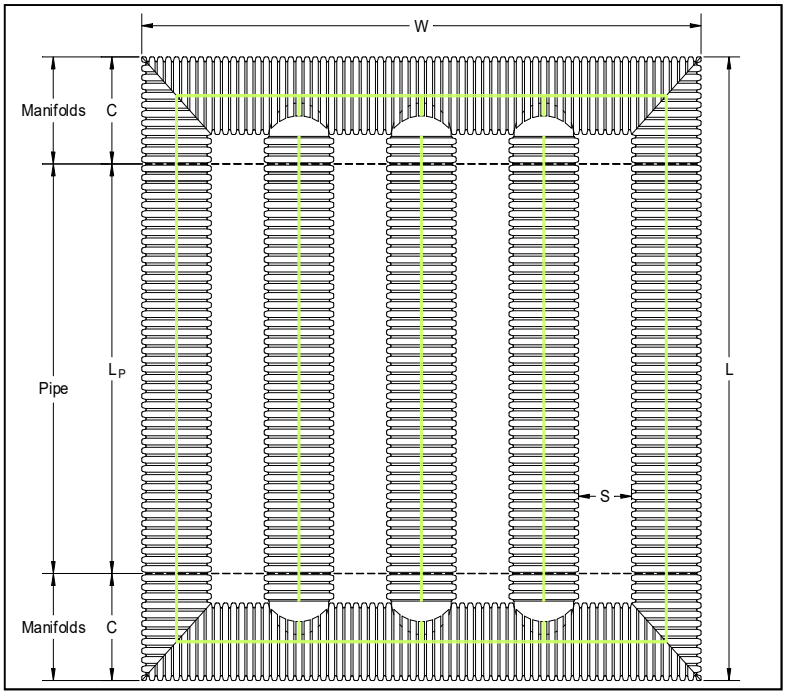
Must meet 48hr drawdown criteria

1.) Design Storage Volume **Vst=** 19737 **ft3**

Manufacturer specifications required. This is not final design, a different system may be selected for construction at permitting phase.

2.) Minimum Pipe Diameter to Satisfy Design **D=** 36 **in** **Pi** **C=** 4.52

3.) Actual DAF for Selected Pipe Size **DAFact=** 0.79 **ft2/ft3**



A. If Width (W) Controls **Wmax=** 130 **ft**

Number of Pipe Runs Required (Npr):	**Npr=**	23 **pipe runs**
Actual Width (Wact):	**Wact=**	126.02 **ft**
System Length (L):	**L=**	124 **ft**
Pipe Length Between Manifolds (Lp):	**Lp=**	114 **ft**
Estimated Storage Provided	**Vp=**	20314 **ft3**
Detention Surface Area Required (Ad):	**Ad=**	15626 **ft2**

Vp must be greater than Vst OK? ___yes ___no

B. If Length (L) Controls **Lmax=** 130 **ft**

Number of Pipe Runs Required (Npr):	**Npr=**	22 **pipe runs**
Actual Width (Wact):	**Wact=**	120.45 **ft**
System Length (L):	**L=**	129 **ft**
Pipe Length Between Manifolds (Lp):	**Lp=**	119 **ft**
Estimated Storage Provided	**Vp=**	20207 **ft3**
Detention Surface Area Required (Ad):	**Ad=**	15538 **ft2**

Vp must be greater than Vst OK? ___yes ___no

1.) This worksheet is for estimations purposes only and should not take the place of a comprehensive engineering design.
2.) Estimated volumes are based on a flat detention system.

Section 4-3.3 15 UNDERGROUND RETENTION VOLUME CALCULATION

Stormwater Detention System Worksheet

Pipe Dia. D (in)	Outside Dia. OD (ft)	C (ft)	Clr. Span S (ft)	Det. Area Factor (ft2/ft3)
12	1.20	1.75	1.10	2.86
15	1.46	2.00	1.07	2.07
18	1.77	2.36	1.19	1.66
24	2.32	2.97	1.57	1.23
30	2.93	4.04	2.23	1.05
36	3.48	4.52	2.09	0.79
42	3.98	5.44	2.92	0.65
42HC	3.90	4.95	2.10	0.64
48HC	4.39	5.45	2.11	0.53
60HC	5.46	5.91	2.87	0.43

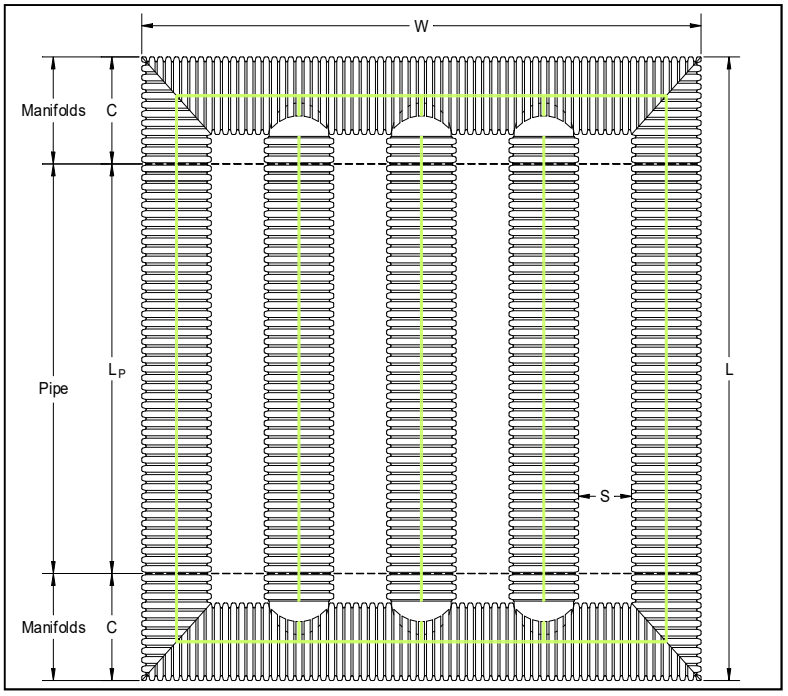
Project Mojave Narrows
Location Hesperia CA
Engineer David Larson, Redbrick Solution
Date 4/30/2019

Must meet 48hr drawdown criteria

1.) Design Storage Volume **Vst=** 352

2.) Minimum Pipe Diameter to Satisfy Design **D=** 36 **in** **Pipe OD=** 3.48 **Clear span (S)=** 2.09 **C=** 4.52

3.) Actual DAF for Selected Pipe Size **DAFact=** 0.79 **ft2/ft3**



A. If Width (W) Controls **Wmax=** 59 **ft**

Number of Pipe Runs Required (Npr):	**Npr=**	10 **pipe runs**
Actual Width (Wact):	**Wact=**	53.61 **ft**
System Length (L):	**L=**	52 **ft**
Pipe Length Between Manifolds (Lp):	**Lp=**	42 **ft**
Estimated Storage Provided	**Vp=**	3726 **ft3**
Detention Surface Area Required (Ad):	**Ad=**	2787 **ft2**

Vp must be greater than Vst OK? ___yes ___no

B. If Length (L) Controls **Lmax=** 52 **ft**

Number of Pipe Runs Required (Npr):	**Npr=**	10 **pipe runs**
Actual Width (Wact):	**Wact=**	53.61 **ft**
System Length (L):	**L=**	51 **ft**
Pipe Length Between Manifolds (Lp):	**Lp=**	41 **ft**
Estimated Storage Provided	**Vp=**	3655 **ft3**
Detention Surface Area Required (Ad):	**Ad=**	2734 **ft2**

Vp must be greater than Vst OK? ___yes ___no

1.) This worksheet is for estimations purposes only and should not take the place of a comprehensive engineering design.
2.) Estimated volumes are based on a flat detention system.

Section 4-3.3 15 UNDERGROUND RETENTION VOLUME CALCULATION

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

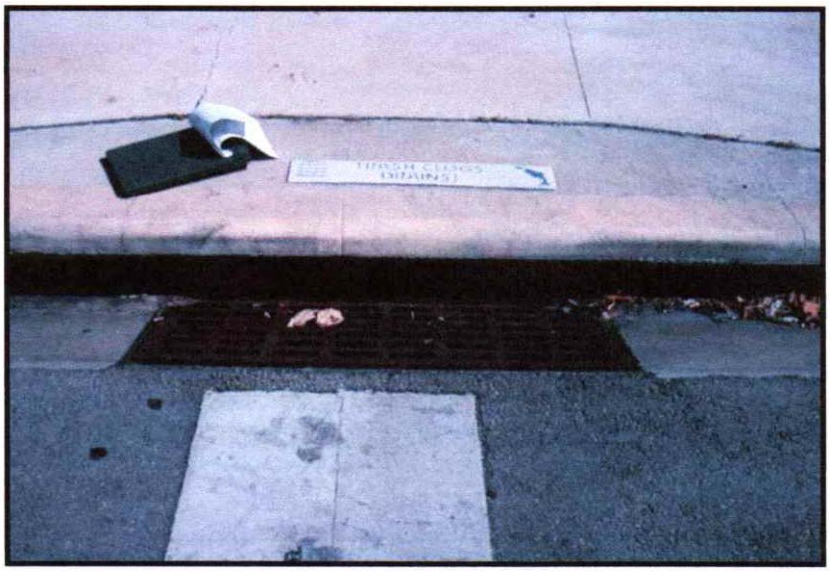
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Outdoor Material Storage Areas SD-34

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutant
- Collect and Convey

Description

Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach

Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design

requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

Designing New Installations

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.
- The storage area should be paved and sufficiently impervious to contain leaks and spills.
- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.
- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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